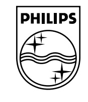
DATA SHEET

TEA0676T
Dual pre-amplifier and equalizer for reverse tape decks

Preliminary specification
File under Integrated Circuits, IC01

1996 Jun 20

Philips Semiconductors





Dual pre-amplifier and equalizer for reverse tape decks

TEA0676T

FEATURES

- Dual head pre-amplifiers
- Reverse head switching
- Equalization with electronically switched time constants
- Output level like Dolby level of 387.5 mV = 0 dB
- Improve EMC behaviour.

GENERAL DESCRIPTION

The TEA0676T is a monolithic bipolar integrated circuit intended for applications in car radios. It includes head and equalization amplifiers with electronically switchable time constants. Furthermore it includes electronically switchable inputs for tape drivers with reverse heads.

The device will operate with power supplies in a range of 7.6 to 12.0 V. The output overload level increases with the increase in supply voltage, so it is advisable to use a regulated power supply or a supply with a long time constant.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CC}	supply voltage		7.6	10	12	V
I_{CC}	supply current	V_{CC} = 10 V	–	10	13	mA
$\frac{S+N}{N}$	signal plus noise-to-noise ratio	unweighted RMS value	67	73	–	dB
$V_{o\ (rms)}$	output voltage (0 dB) (RMS value)	gain internal = 40 dB; linear	–	387.5	–	mV

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
TEA0676T	SO16	plastic small outline package; 16 leads; body width 7.5 mm	SOT162-1

BLOCK DIAGRAM

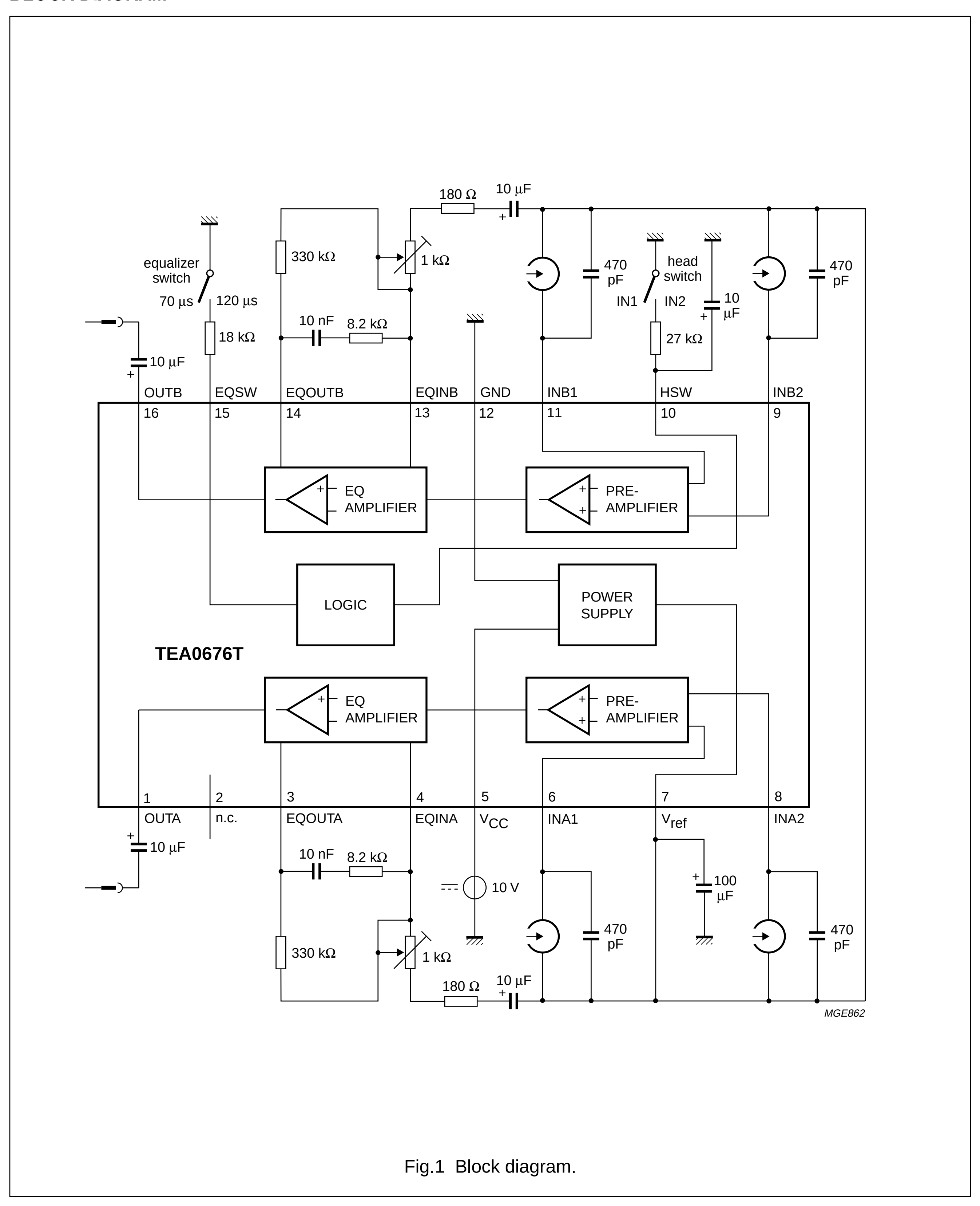


Fig.1 Block diagram.

PINNING

SYMBOL	PIN	DESCRIPTION
OUTA	1	output channel A
n.c.	2	not connected
EQOUTA	3	output equalizer channel A
EQINA	4	input equalizer channel A
V_{CC}	5	supply voltage
INA1	6	input channel A1 (forward or reverse)
V_{ref}	7	reference voltage
INA2	8	input channel A2 (reverse or forward)
INB2	9	input channel B2 (reverse or forward)
HSW	10	input head switch
INB1	11	input channel B1 (forward or reverse)
GND	12	ground
EQINB	13	input equalizer channel B
EQOUTB	14	output equalizer channel B
EQSW	15	input equalizer switch
OUTB	16	output channel B

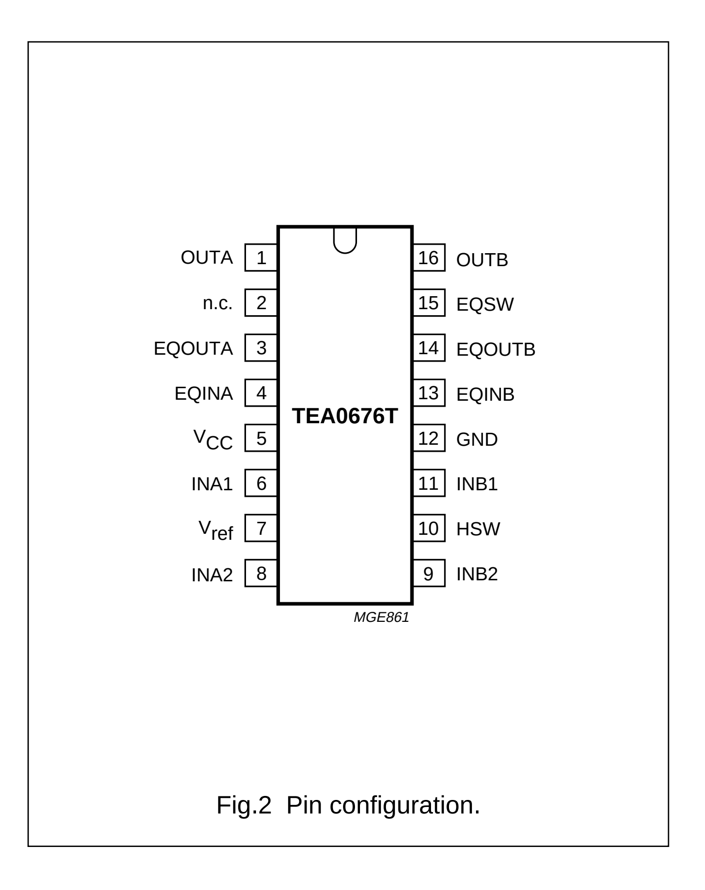


Fig.2 Pin configuration.

FUNCTIONAL DESCRIPTION

Gain of pre-amplifier = 30 dB; minimum gain of EQ-amplifier = 24.5 dB at f = 1 kHz with 70 µs cut-off frequency.

Head switching is achieved when pin 10 (HSW) is connected to ground via a 27 kΩ resistor (inputs INA2, INB2 are active) or connected to HIGH level ($0.8V_{CC}$) (inputs INA1, INB1 are active).

Equalization time constant switching (70 µs/120 µs) is achieved when pin 15 (EQSW) is connected to ground via an 18 kΩ resistor (120 µs) or left open-circuit (70 µs).

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CC}	supply voltage		0	14	V
$\Delta V_{(12-x)}$	voltage at pins 1 to 11, 13 to 16 with respect to pin 12		0	V_{CC}	V
T_{stg}	storage temperature		–55	+150	°C
T_{amb}	operating ambient temperature		–40	+85	°C
V_{es}	electrostatic handling voltage	note 1	–2000	+2000	V
		note 2	–500	+500	V

Notes

1. Human body model: C = 100 pF; R = 1.5 kΩ.
2. Machine model: C = 200 pF; R = 0 Ω.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j-a}$	thermal resistance from junction to ambient in free air	70	K/W

CHARACTERISTICS

V_{CC} = 10 V; R_L = 10 kΩ; C_L = 2.5 nF; T_{amb} = 25 °C; V_o = 0 dB means 387.5 mV at output; all levels are referenced to 387.5 mV with 0 dB as standard; EQ switch in 70 µs position; unless otherwise specified; see notes 1 and 2.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supply						
V_{CC}	supply voltage (pin 5)		7.6	10.0	12.0	V
I_{CC}	supply current		–	10	13	mA
THD	total harmonic distortion	f = 1 kHz; V_o = 0 dB	–	0.08	0.15	%
		f = 10 kHz; V_o = 6 dB	–	0.15	0.3	%
H_R	headroom at output	V_{CC} = 7.6 V; THD = 1%; f = 1 kHz	12	–	–	dB
PSRR	power supply ripple rejection	$V_{R(rms)}$ < 0.25 V; f = 1 kHz	–	50	–	dB
α_{cs}	channel separation	selective measurement; f = 1 kHz; V_o = 10 dB	57	63	–	dB
α_m	channel matching	selective measurement; f = 1 kHz; V_o = 0 dB	–0.5	–	+0.5	dB
α_{ct}	crosstalk between active and inactive input	selective measurement; f = 1 kHz; V_o = 10 dB	70	77	–	dB
$\frac{S+N}{N}$	signal plus noise-to-noise ratio (RMS value)	unweighted; f = 20 Hz to 20 kHz; R_s = 0 Ω; internal gain 40 dB; linear; see Fig.13	67	73	–	dB
$V_{no(rms)}$	equivalent input noise voltage (RMS value)	unweighted; f = 20 Hz to 20 kHz; R_s = 0 Ω	–	0.8	–	µV
G_v	voltage gain of pre-amplifier	from pin INA1 or INA2 to pin EQINA and from pin INB1 or INB2 to pin EQINB	29	30	31	dB
A_v	open-loop amplification	pin INA1 to pin OUTA and pin INB1 to pin OUTB				
		f = 10 kHz	80	86	–	dB
		f = 400 Hz	104	110	–	dB
R_{EQ}	equalization resistor		4.7	5.8	6.9	kΩ
Z_I	input impedance pre-amplifier		60	100	–	kΩ
Z_O	output impedance EQ-amplifier		–	80	100	Ω
R_L	output load resistance		10	–	–	kΩ
C_L	output load capacitance		0	–	10	nF
$V_{offset(DC)}$	input offset voltage	pins INA1, INA2, INB1 and INB2 connected to V_{ref}	–	2	–	mV
$I_{O(GND)}$	DC current capability	output to ground	–2	–	–	mA
$I_{O(VCC)}$	DC current capability	output to V_{CC}	300	–	–	µA
EMC	DC offset voltage at pins 1 and 16	f = 900 MHz; V_i = 6 V (RMS); see Figs 12, 14 and 15	–	50	–	mV

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Switching thresholds						
EQUALIZATION TIME CONSTANT SWITCHING						
V_{EQSW}	pin voltage	load current +100 to –100 µA	–	$0.8V_{CC}$	–	V
I_{EQSW}	input current	V_{EQSW} = 0 to V_{CC}	–180	–	+180	µA
$V_{EQSW(HIGH)}$	pin voltage	time constant 70 µs active	$\frac{1}{2}V_{CC}$ + 0.5	–	V_{CC}	V
$V_{EQSW(LOW)}$	pin voltage	time constant 120 µs active	0	–	$\frac{1}{2}V_{CC}$ – 0.5	V
HEAD SWITCHING						
V_{HSW}	pin voltage	load current +90 to –90 µA	–	$0.8V_{CC}$	–	V
I_{HSW}	input current	V_{HSW} = 0 to V_{CC}	–170	–	+170	µA
$V_{HSW(HIGH)}$	pin voltage	inputs INA1 and INB1 active	$\frac{1}{2}V_{CC}$ + 0.5	–	V_{CC}	V
$V_{HSW(LOW)}$	pin voltage	inputs INA2 and INB2 active	0	–	$\frac{1}{2}V_{CC}$ – 0.5	V

Notes

1. For an application with a fixed equalization time constant of 120 µs the equalizing network may be applied completely external. In this application the 8.2 kΩ resistor has to be changed to 14 kΩ and the internal resistor R_{EQ} = 5.8 kΩ must be short-circuited by fixing the equalization switch input at 70 µs (pin 15 left open-circuit). To activate the inputs INA1 and INB1, pin 10 (HSW) might be left open-circuit. In this event the DC level at pin 10 (HSW) is $0.8V_{CC}$
2. It is recommended to switch off V_{CC} with a gradient of 400 V/s at maximum to avoid plops on the tape in the event of contact between tape and tape head while switching off.

INTERNAL PIN CONFIGURATIONS

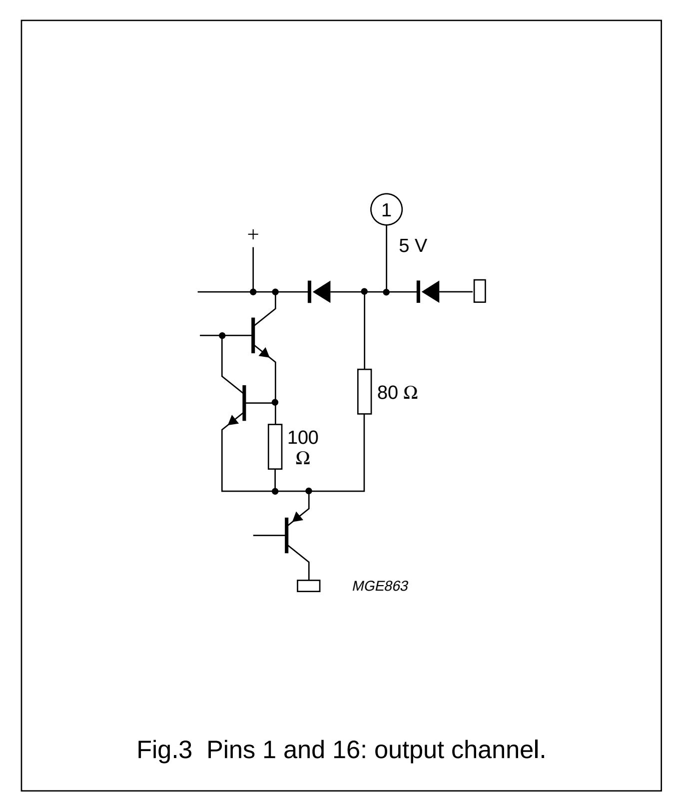


Fig.3 Pins 1 and 16: output channel.

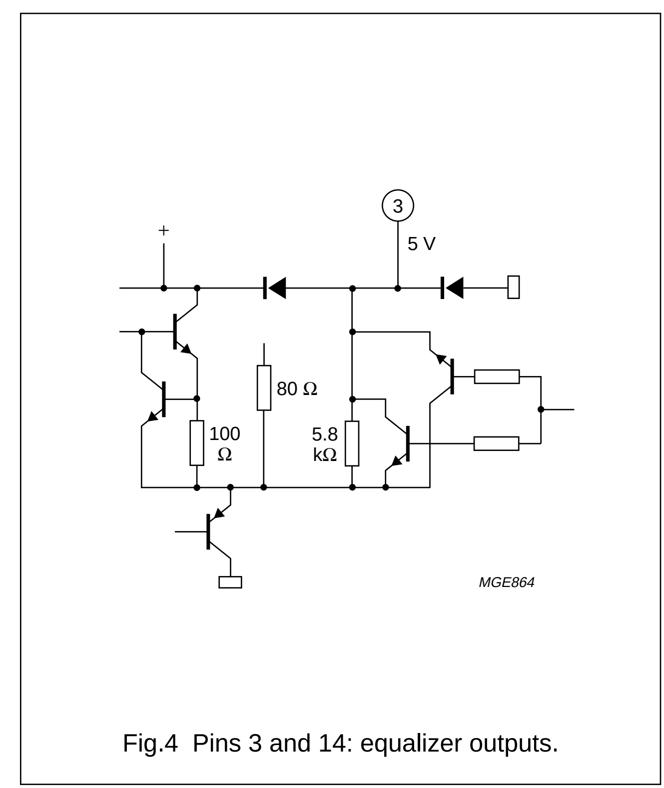


Fig.4 Pins 3 and 14: equalizer outputs.

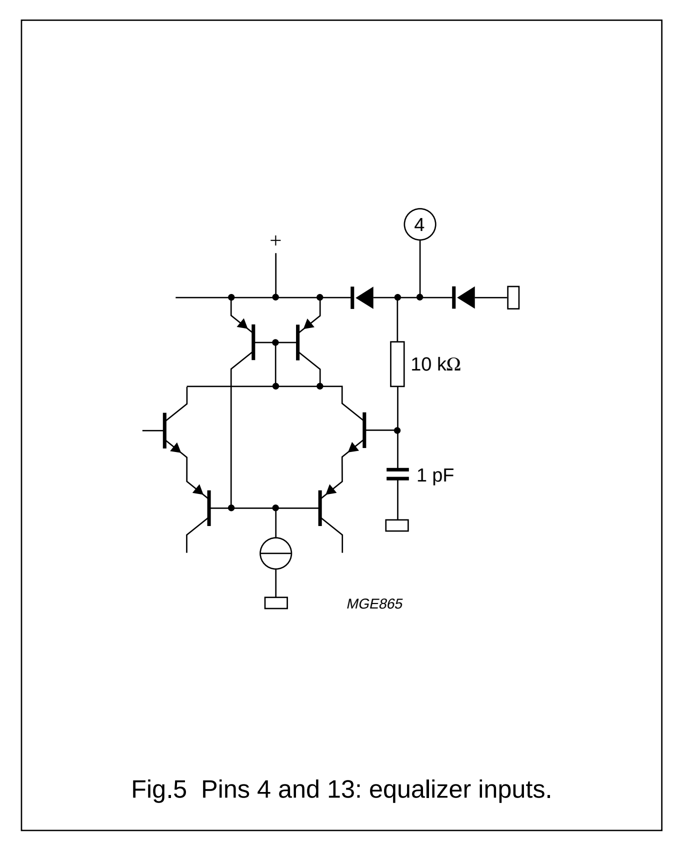


Fig.5 Pins 4 and 13: equalizer inputs.

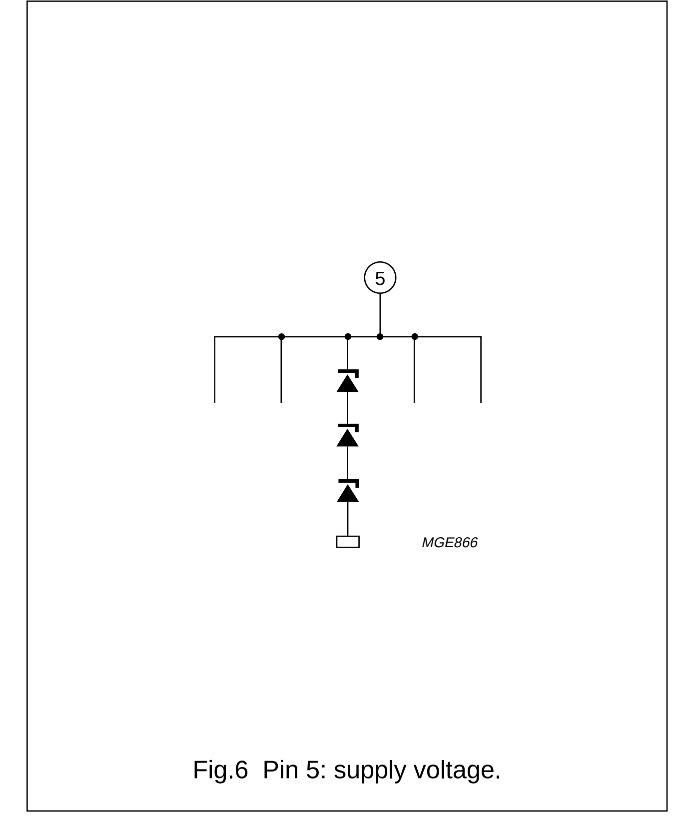


Fig.6 Pin 5: supply voltage.

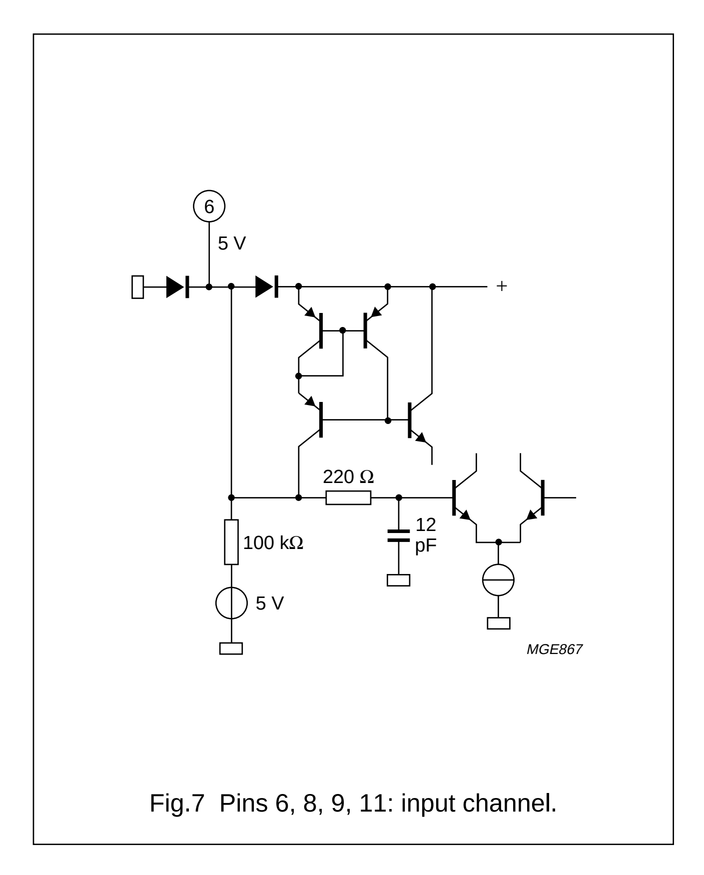


Fig.7 Pins 6, 8, 9, 11: input channel.

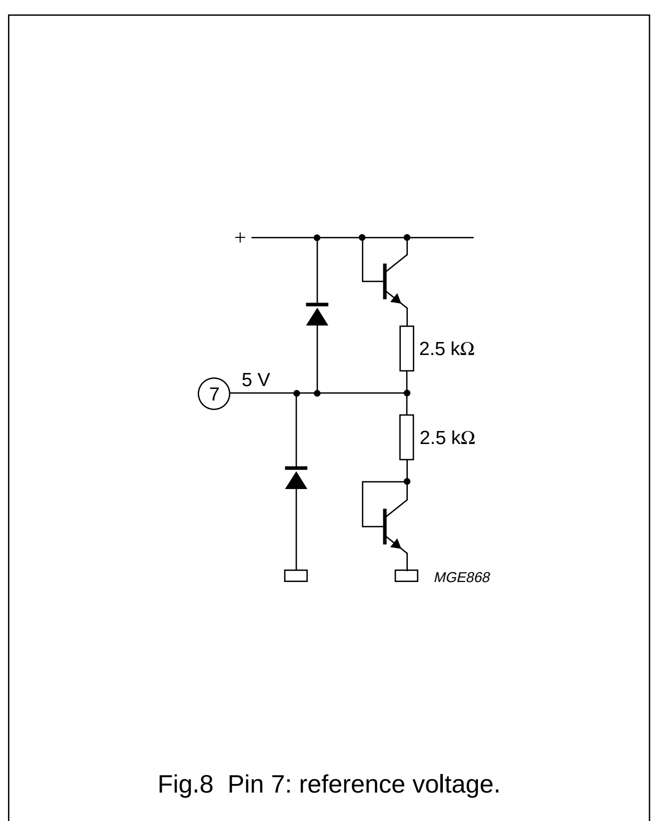


Fig.8 Pin 7: reference voltage.

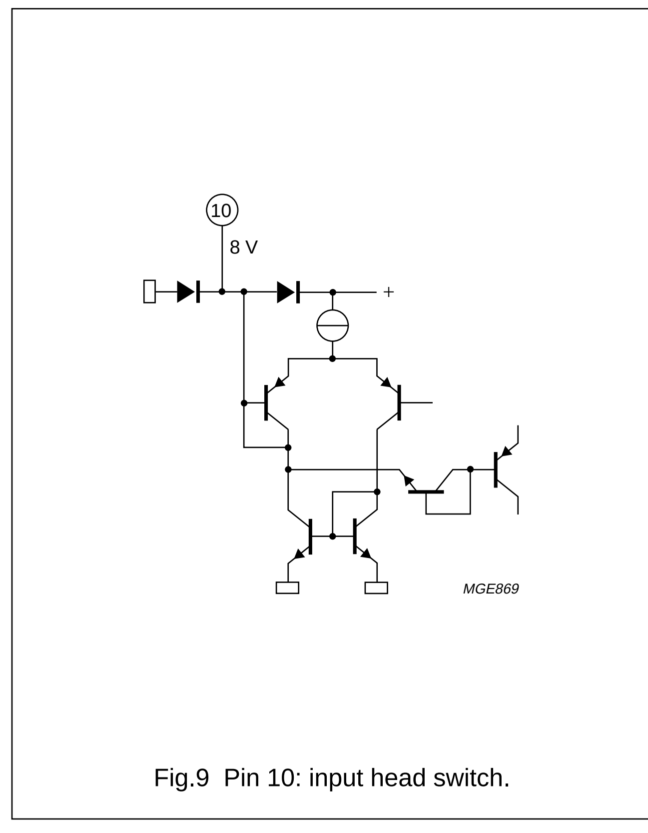


Fig.9 Pin 10: input head switch.

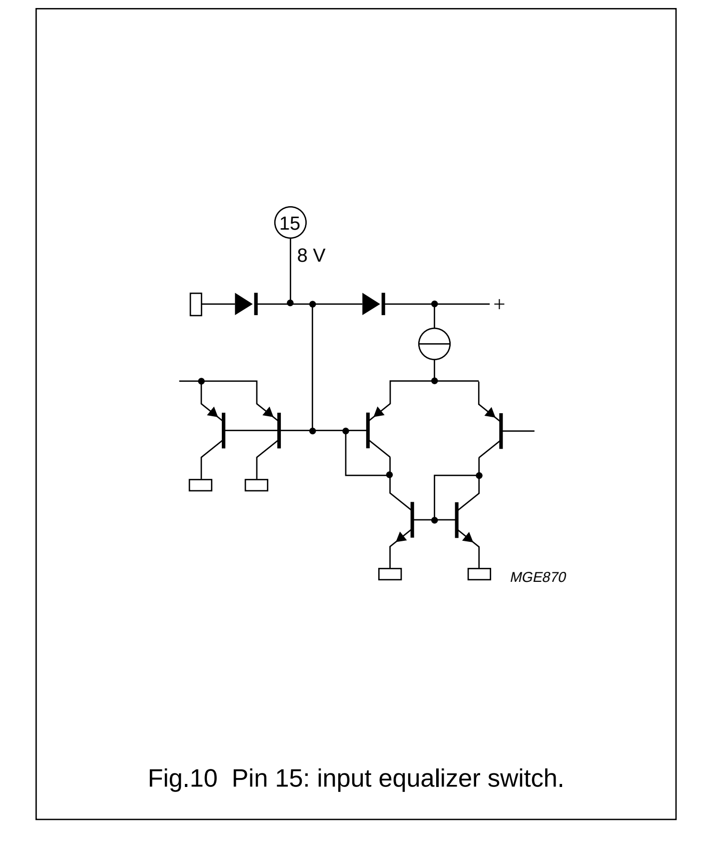


Fig.10 Pin 15: input equalizer switch.

TEST AND APPLICATION INFORMATION

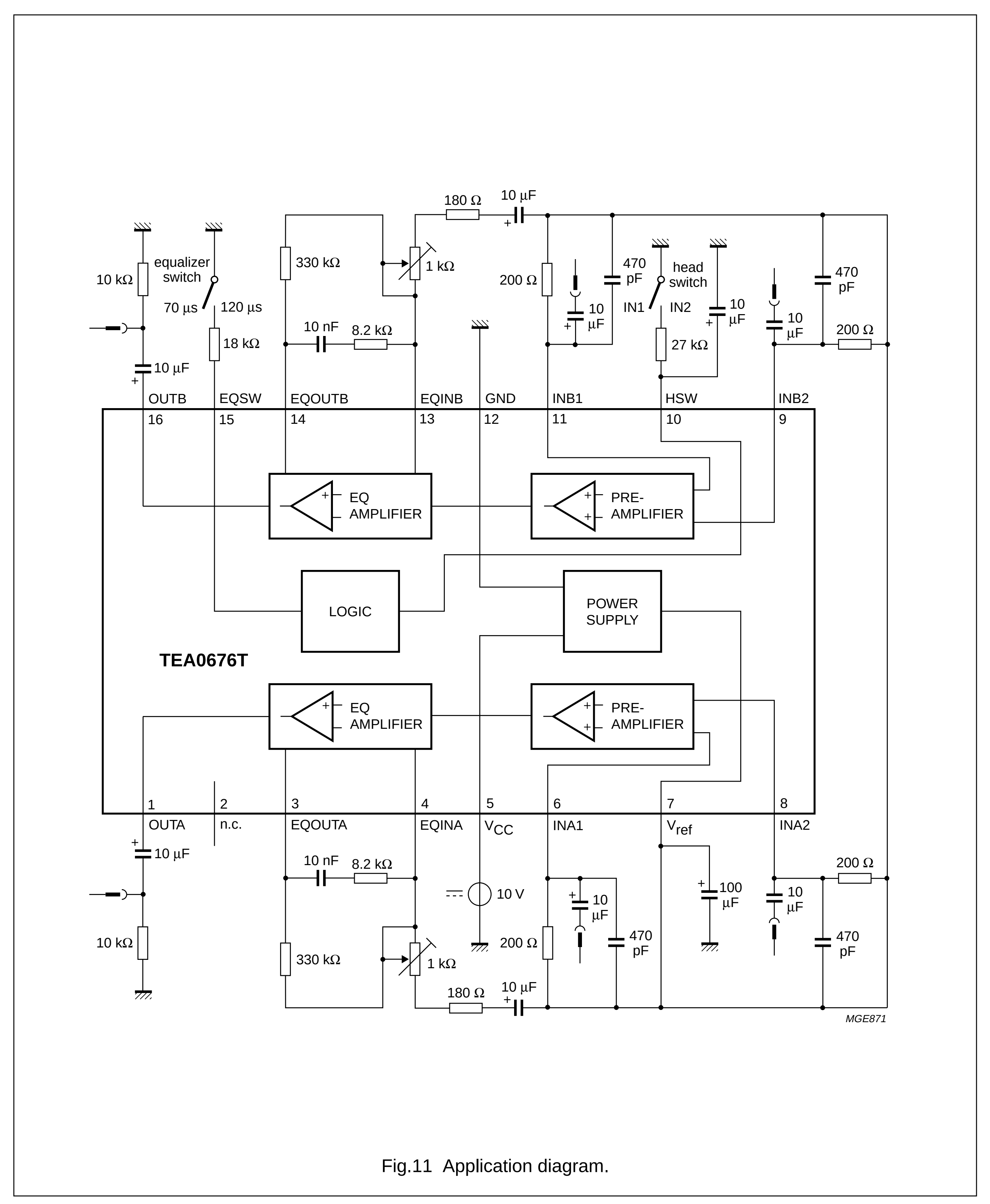


Fig.11 Application diagram.

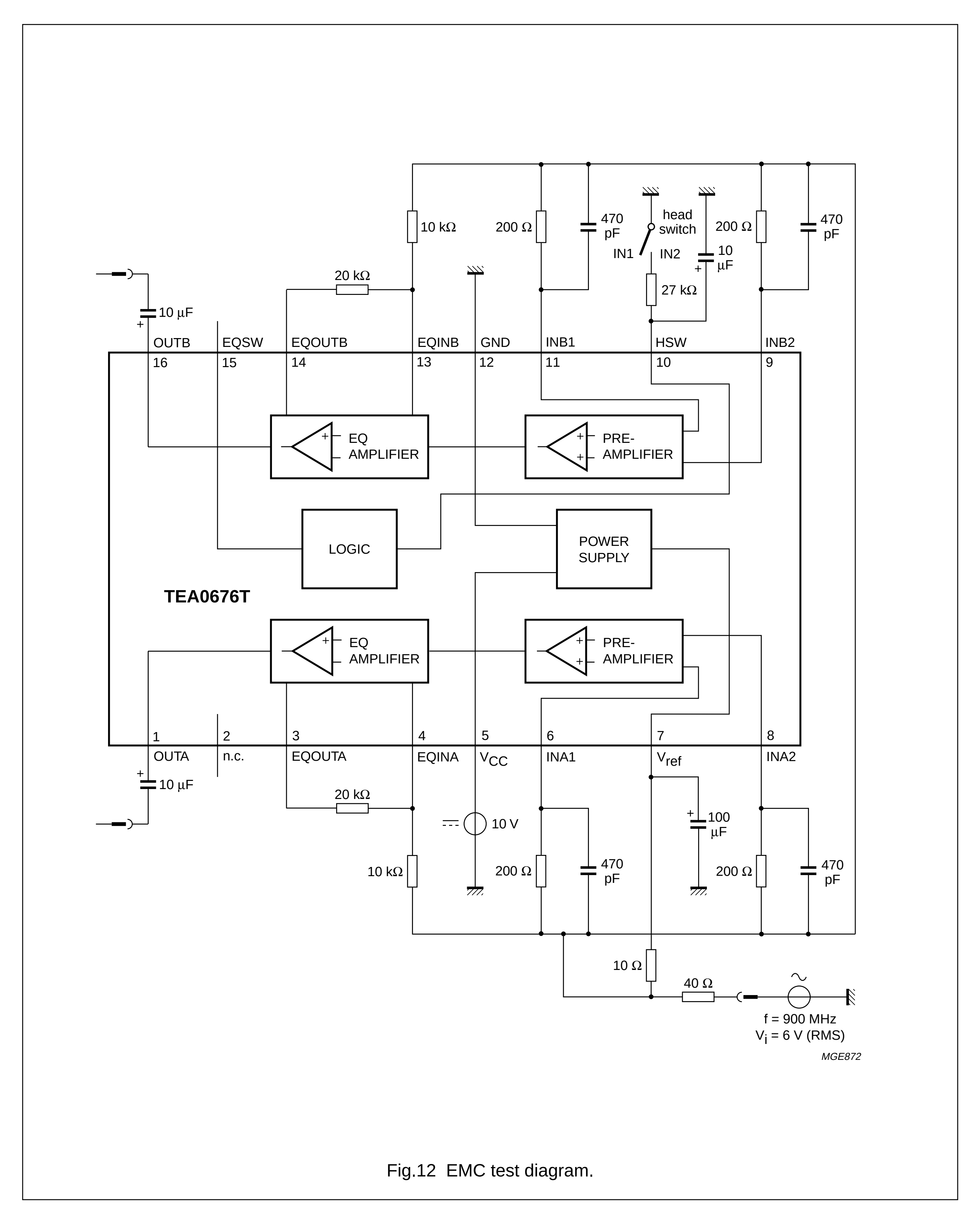


Fig.12 EMC test diagram.

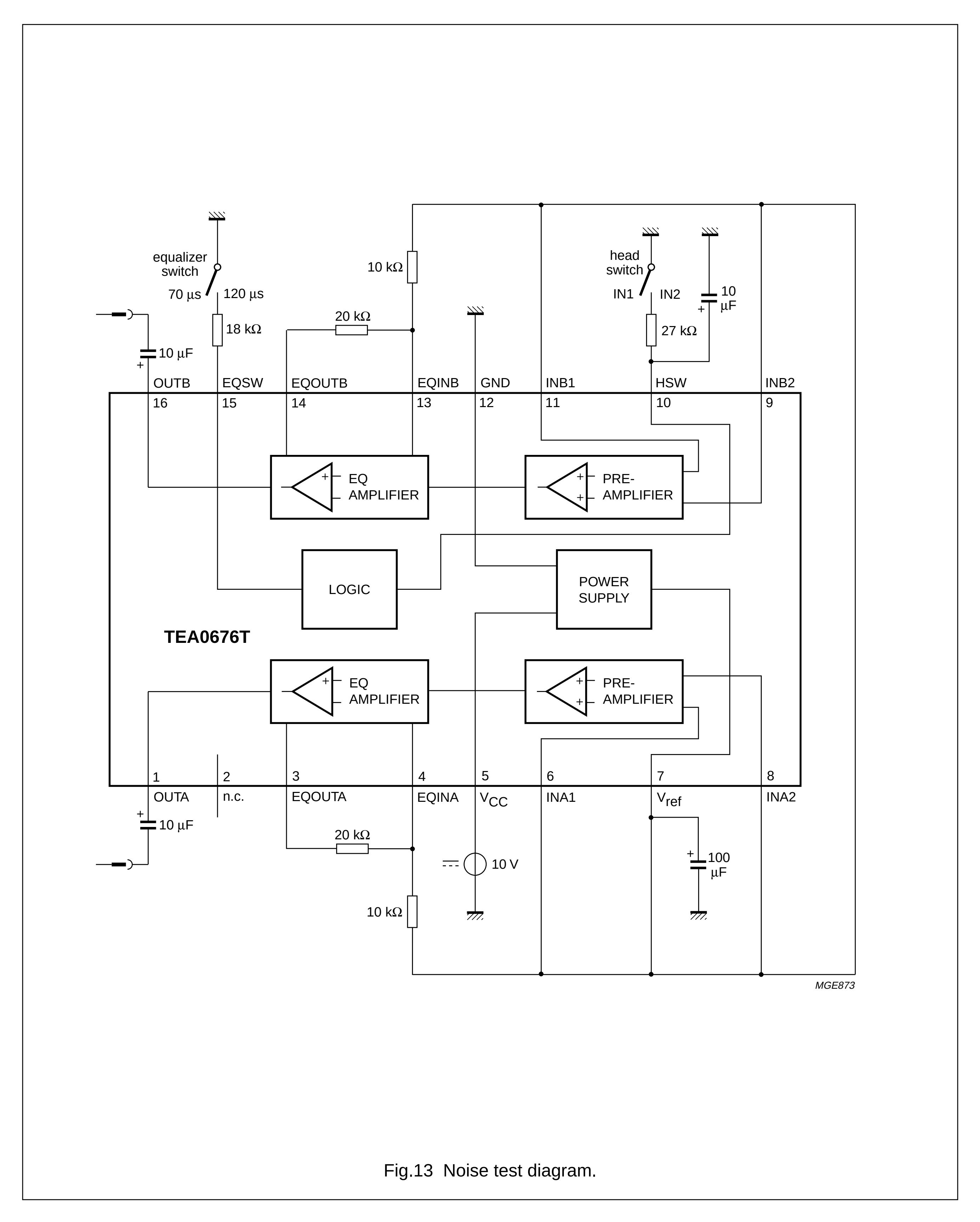
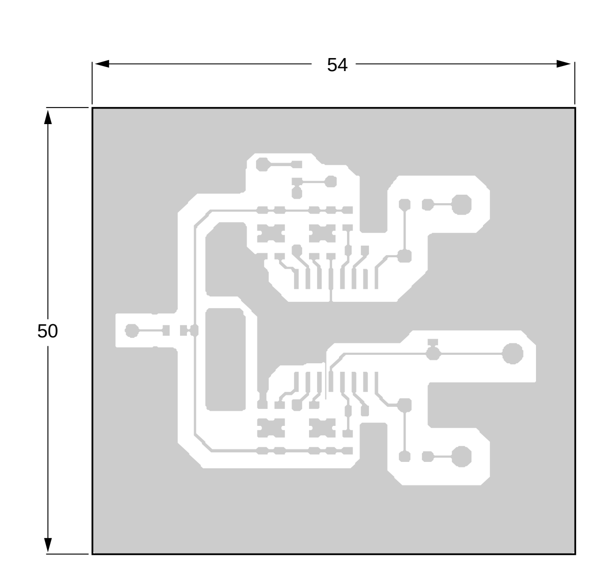


Fig.13 Noise test diagram.

LAYOUT OF PRINTED CIRCUIT BOARD FOR EMC TEST CIRCUIT



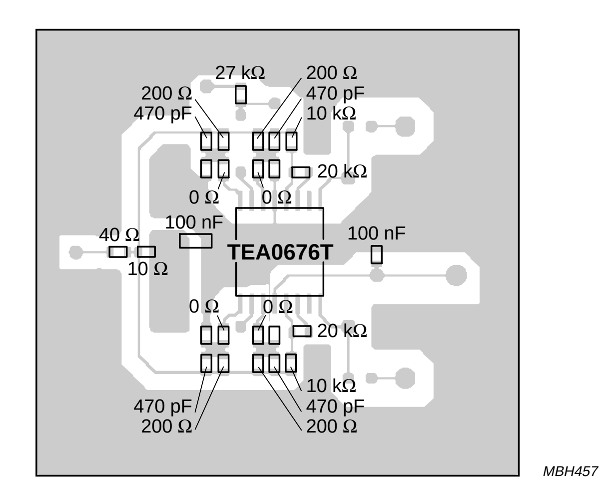


Fig.14 Top side with components.

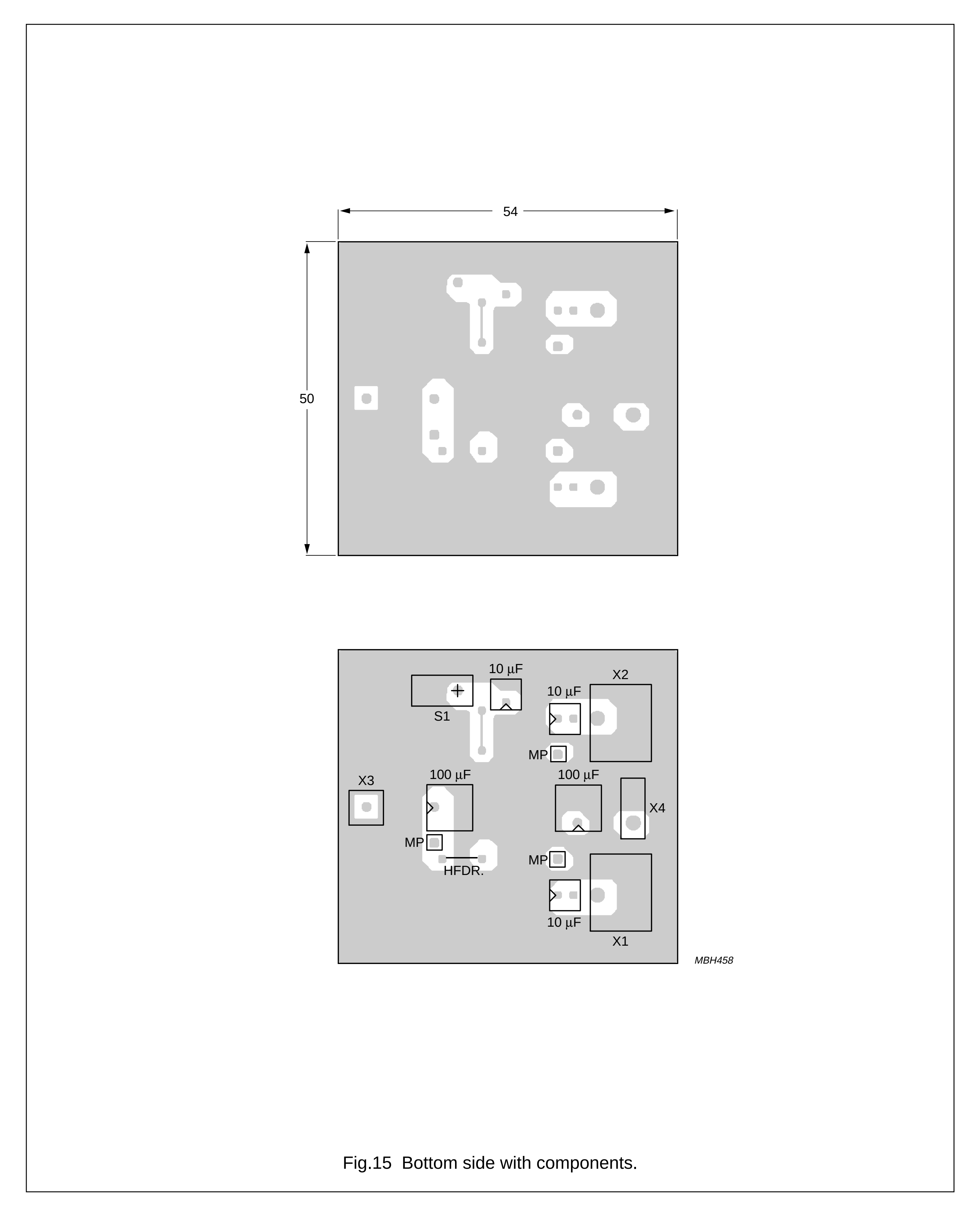
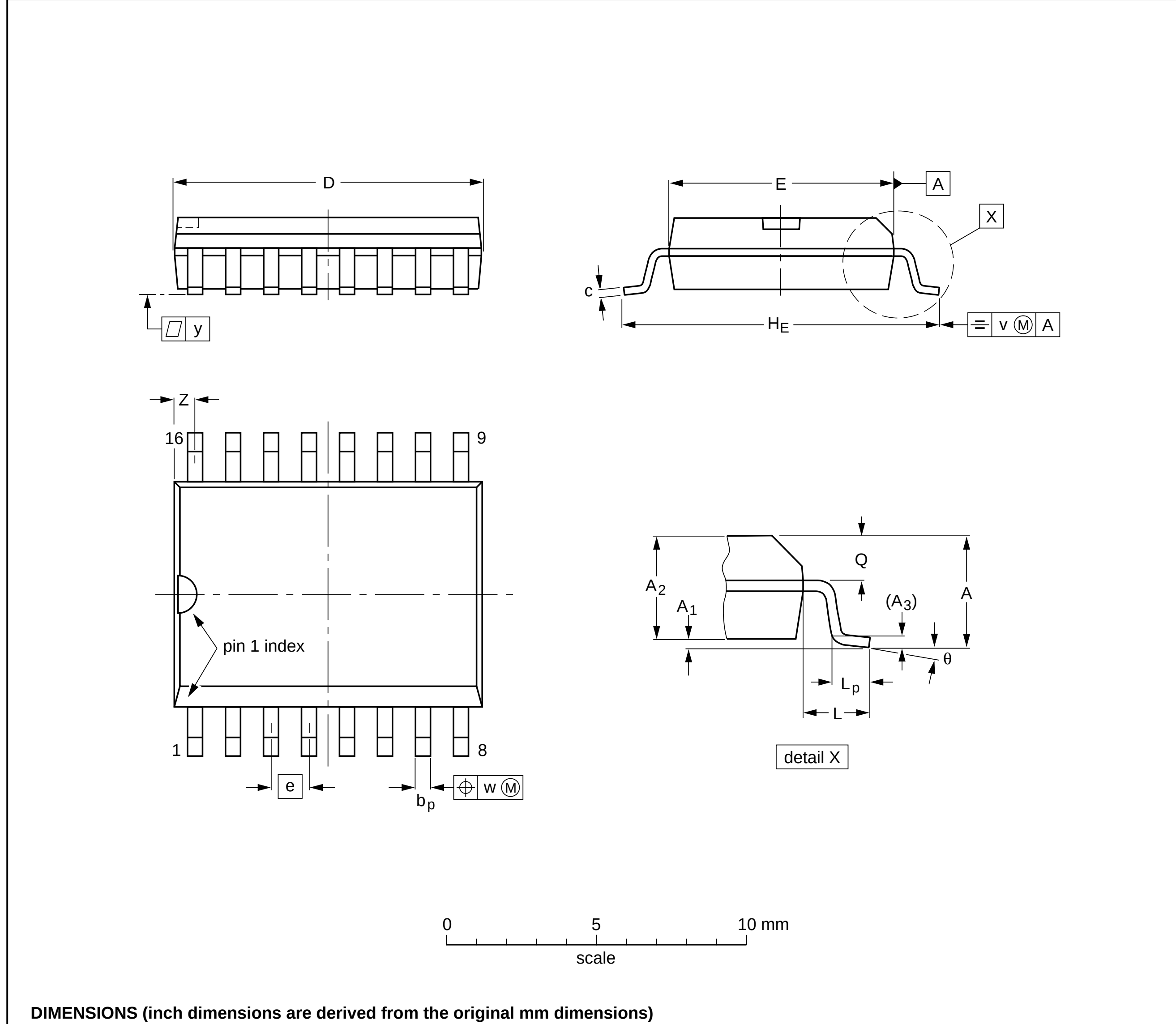


Fig.15 Bottom side with components.

PACKAGE OUTLINE

SO16: plastic small outline package; 16 leads; body width 7.5 mm **SOT162-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (1)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	2.65	0.30 0.10	2.45 2.25	0.25	0.49 0.36	0.32 0.23	10.5 10.1	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8° 0°
inches	0.10	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.41 0.40	0.30 0.29	0.050	0.42 0.39	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT162-1	075E03	MS-013AA				~~92-11-17~~ 95-01-24

SOLDERING

Introduction

There is no soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and surface mounted components are mixed on one printed-circuit board. However, wave soldering is not always suitable for surface mounted ICs, or for printed-circuits with high population densities. In these situations reflow soldering is often used.

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our *"IC Package Databook"* (order code 9398 652 90011).

Reflow soldering

Reflow soldering techniques are suitable for all SO packages.

Reflow soldering requires solder paste (a suspension of fine solder particles, flux and binding agent) to be applied to the printed-circuit board by screen printing, stencilling or pressure-syringe dispensing before package placement.

Several techniques exist for reflowing; for example, thermal conduction by heated belt. Dwell times vary between 50 and 300 seconds depending on heating method. Typical reflow temperatures range from 215 to 250 °C.

Preheating is necessary to dry the paste and evaporate the binding agent. Preheating duration: 45 minutes at 45 °C.

Wave soldering

Wave soldering techniques can be used for all SO packages if the following conditions are observed:

- A double-wave (a turbulent wave with high upward pressure followed by a smooth laminar wave) soldering technique should be used.
- The longitudinal axis of the package footprint must be parallel to the solder flow.
- The package footprint must incorporate solder thieves at the downstream end.

During placement and before soldering, the package must be fixed with a droplet of adhesive. The adhesive can be applied by screen printing, pin transfer or syringe dispensing. The package can be soldered after the adhesive is cured.

Maximum permissible solder temperature is 260 °C, and maximum duration of package immersion in solder is 10 seconds, if cooled to less than 150 °C within 6 seconds. Typical dwell time is 4 seconds at 250 °C.

A mildly-activated flux will eliminate the need for removal of corrosive residues in most applications.

Repairing soldered joints

Fix the component by first soldering two diagonally-opposite end leads. Use only a low voltage soldering iron (less than 24 V) applied to the flat part of the lead. Contact time must be limited to 10 seconds at up to 300 °C. When using a dedicated tool, all other leads can be soldered in one operation within 2 to 5 seconds between 270 and 320 °C.

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

NOTES

NOTES

Philips Semiconductors – a worldwide company

Argentina: see South America

Australia: 34 Waterloo Road, NORTH RYDE, NSW 2113, Tel. +61 2 805 4455, Fax. +61 2 805 4466

Austria: Computerstr. 6, A-1101 WIEN, P.O. Box 213, Tel. +43 1 60 101, Fax. +43 1 60 101 1210

Belarus: Hotel Minsk Business Center, Bld. 3, r. 1211, Volodarski Str. 6, 220050 MINSK, Tel. +375 172 200 733, Fax. +375 172 200 773

Belgium: see The Netherlands

Brazil: see South America

Bulgaria: Philips Bulgaria Ltd., Energoproject, 15th floor, 51 James Bourchier Blvd., 1407 SOFIA, Tel. +359 2 689 211, Fax. +359 2 689 102

Canada: PHILIPS SEMICONDUCTORS/COMPONENTS, Tel. +1 800 234 7381, Fax. +1 708 296 8556

China/Hong Kong: 501 Hong Kong Industrial Technology Centre, 72 Tat Chee Avenue, Kowloon Tong, HONG KONG, Tel. +852 2319 7888, Fax. +852 2319 7700

Colombia: see South America

Czech Republic: see Austria

Denmark: Prags Boulevard 80, PB 1919, DK-2300 COPENHAGEN S, Tel. +45 32 88 2636, Fax. +45 31 57 1949

Finland: Sinikalliontie 3, FIN-02630 ESPOO, Tel. +358 615 800, Fax. +358 615 80920

France: 4 Rue du Port-aux-Vins, BP317, 92156 SURESNES Cedex, Tel. +33 1 40 99 6161, Fax. +33 1 40 99 6427

Germany: Hammerbrookstraße 69, D-20097 HAMBURG, Tel. +49 40 23 52 60, Fax. +49 40 23 536 300

Greece: No. 15, 25th March Street, GR 17778 TAVROS, Tel. +30 1 4894 339/911, Fax. +30 1 4814 240

Hungary: see Austria

India: Philips INDIA Ltd, Shivsagar Estate, A Block, Dr. Annie Besant Rd. Worli, MUMBAI 400 018, Tel. +91 22 4938 541, Fax. +91 22 4938 722

Indonesia: see Singapore

Ireland: Newstead, Clonskeagh, DUBLIN 14, Tel. +353 1 7640 000, Fax. +353 1 7640 200

Israel: RAPAC Electronics, 7 Kehilat Saloniki St, TEL AVIV 61180, Tel. +972 3 645 0444, Fax. +972 3 648 1007

Italy: PHILIPS SEMICONDUCTORS, Piazza IV Novembre 3, 20124 MILANO, Tel. +39 2 6752 2531, Fax. +39 2 6752 2557

Japan: Philips Bldg 13-37, Kohnan 2-chome, Minato-ku, TOKYO 108, Tel. +81 3 3740 5130, Fax. +81 3 3740 5077

Korea: Philips House, 260-199 Itaewon-dong, Yongsan-ku, SEOUL, Tel. +82 2 709 1412, Fax. +82 2 709 1415

Malaysia: No. 76 Jalan Universiti, 46200 PETALING JAYA, SELANGOR, Tel. +60 3 750 5214, Fax. +60 3 757 4880

Mexico: 5900 Gateway East, Suite 200, EL PASO, TEXAS 79905, Tel. +1 800 234 7381, Fax. +1 708 296 8556

Middle East: see Italy

Netherlands: Postbus 90050, 5600 PB EINDHOVEN, Bldg. VB, Tel. +31 40 27 83749, Fax. +31 40 27 88399

New Zealand: 2 Wagener Place, C.P.O. Box 1041, AUCKLAND, Tel. +64 9 849 4160, Fax. +64 9 849 7811

Norway: Box 1, Manglerud 0612, OSLO, Tel. +47 22 74 8000, Fax. +47 22 74 8341

Philippines: Philips Semiconductors Philippines Inc., 106 Valero St. Salcedo Village, P.O. Box 2108 MCC, MAKATI, Metro MANILA, Tel. +63 2 816 6380, Fax. +63 2 817 3474

Poland: Ul. Lukiska 10, PL 04-123 WARSZAWA, Tel. +48 22 612 2831, Fax. +48 22 612 2327

Portugal: see Spain

Romania: see Italy

Russia: Philips Russia, Ul. Usatcheva 35A, 119048 MOSCOW, Tel. +7 095 926 5361, Fax. +7 095 564 8323

Singapore: Lorong 1, Toa Payoh, SINGAPORE 1231, Tel. +65 350 2538, Fax. +65 251 6500

Slovakia: see Austria

Slovenia: see Italy

South Africa: S.A. PHILIPS Pty Ltd., 195-215 Main Road Martindale, 2092 JOHANNESBURG, P.O. Box 7430 Johannesburg 2000, Tel. +27 11 470 5911, Fax. +27 11 470 5494

South America: Rua do Rocio 220 - 5th floor, Suite 51, CEP: 04552-903-SÃO PAULO-SP, Brazil, P.O. Box 7383 (01064-970), Tel. +55 11 821 2333, Fax. +55 11 829 1849

Spain: Balmes 22, 08007 BARCELONA, Tel. +34 3 301 6312, Fax. +34 3 301 4107

Sweden: Kottbygatan 7, Akalla, S-16485 STOCKHOLM, Tel. +46 8 632 2000, Fax. +46 8 632 2745

Switzerland: Allmendstrasse 140, CH-8027 ZÜRICH, Tel. +41 1 488 2686, Fax. +41 1 481 7730

Taiwan: PHILIPS TAIWAN Ltd., 23-30F, 66, Chung Hsiao West Road, Sec. 1, P.O. Box 22978, TAIPEI 100, Tel. +886 2 382 4443, Fax. +886 2 382 4444

Thailand: PHILIPS ELECTRONICS (THAILAND) Ltd., 209/2 Sanpavuth-Bangna Road Prakanong, BANGKOK 10260, Tel. +66 2 745 4090, Fax. +66 2 398 0793

Turkey: Talatpasa Cad. No. 5, 80640 GÜLTEPE/ISTANBUL, Tel. +90 212 279 2770, Fax. +90 212 282 6707

Ukraine: PHILIPS UKRAINE, 2A Akademika Koroleva str., Office 165, 252148 KIEV, Tel. +380 44 476 0297/1642, Fax. +380 44 476 6991

United Kingdom: Philips Semiconductors Ltd., 276 Bath Road, Hayes, MIDDLESEX UB3 5BX, Tel. +44 181 730 5000, Fax. +44 181 754 8421

United States: 811 East Arques Avenue, SUNNYVALE, CA 94088-3409, Tel. +1 800 234 7381, Fax. +1 708 296 8556

Uruguay: see South America

Vietnam: see Singapore

Yugoslavia: PHILIPS, Trg N. Pasica 5/v, 11000 BEOGRAD, Tel. +381 11 825 344, Fax.+381 11 635 777

For all other countries apply to: Philips Semiconductors, Marketing & Sales Communications, Building BE-p, P.O. Box 218, 5600 MD EINDHOVEN, The Netherlands, Fax. +31 40 27 24825

Internet: http://www.semiconductors.philips.com/ps/

Printed in The Netherlands 517021/50/01/pp20 Date of release: 1996 Jun 20 Document order number: 9397 750 00922

Let's make things better.

Philips
Semiconductors



